23.WEED MANAGEMENT IN SUGARCANE

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WEED MANAGEMENT IN SUGARCANE

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Sugarcane (*Saccharum officinarum* L.) a crop of tropical and subtropical areas, provides around 80% of the world production of sugar and 35% of the ethanol (FAO 2012).

A member of the Poaceae, has tillers or stems bunched in to primary shoots, with a sucrose content of 10-18% and fibre content of 10-15% at harvest (Fauconnier 1993).

	Area	Production	Productivity
World	13 m ha	1254.8 mt	96 t/ha (2011-12)
India	51.44 l ha	359.33 mt	69.67 t/ha (2014-15)

Nature of weed problem

In sugarcane cultivation the nature of weed problem is quite different from other crops.

1. It is planted with a relatively wider row spacing.
2. Its growth is very slow in the initial stages, as it takes about 30 to 45 days for complete germination and another 60-75 days for developing full canopy cover.
3. It is grown under abundant water and nutrient supply conditions.
4. In ratoon crop very little preparatory tillage is taken up, hence weeds that have established in the plant crop tend to flourish well.

Damage / losses caused by weeds

- In India, the **reported cane yield losses** range from **12 to 72%**. If weeds are not properly controlled in the initial stages, the yield loss could go upto **17.5 t/ha.**
- **Twining weeds** like *Ipomoea* sp. which twine around clumps affect cane growth and cause around **25% loss in yield**. Twining weeds escalating cost of cultivation and cause serious harvesting problem.
- The total cane yield loss in the country per annum is around **25 million** tonnes (equivalent to 2.5 million tonnes of sugar) valued around **INR 1500 crores.**

- **Poor growth** of sugarcane resulting from weed infestation also causes quality deterioration.

- Bermuda grass (*Cynodon dactylon*), the cogan grass (*Imperata cylindrica*) and other graminacious weeds are known to be alternate hosts to Ratoon Stunting Disease (RSD) of sugarcane.

- Weeds **remove 4 times of N and P and 2.5 times of K** as compared to sugarcane during the first seven weeks period.

Period of weed growth and critical period of crop-weed competition

- Weeds interfere with crops at anytime they are present in the crop.
- As a thumb rule, first ¼ - 1/3 of the growing period in many crops is critical period
- The duration of a sugarcane crop is 12-16 months. So, in cane, the **initial 120 days** can be considered as critical period for crop-weed competition.

- Weeding around **100-120 days or 120-150 days** after planting cane is as important as early weeding done in the initial crop growing period (30-40 days), as weed seeds keep on germinating because of **wide row spacing and sun light reaching in the exposed inter row spaces** (until full crop canopy development).
- Subsequently, frequent irrigations, heavy fertilizer dose and high temperature induce a number of new flushes of weeds, both grasses broadleaved weeds.

Weed flora

Sugarcane being a perennial crop (3-4 years in the same field) having all types of weeds, seasonal, annual and perennials.

Weeds which emerge only during rainy season are

Echinochloa colonum and *E. crusgalli* (grasses), *Amaranthus viridis* and *Celosia argentia* (broad leaved weeds).

Weeds which emerge before the start of monsoon are

Cyperus rotundus (sedge), *Cynodon dactylon* and *Sorghum halepense* (grasses).

Annual weeds like

Chenopodium album, *Lathyrus sativa*, *Vicia spp.*, *Angallis arvensis* and *Fumaria parviflora* .

Parasitic weeds

Partial root parasite – *Striga lutea*

Cyperus rotundus

Cynodon dactylon

Sorghum helepense

Amaranthus spinosus

A. viridis

Convolvulus arvensis

Ipomea sp.

Chinopodium album

Commelina benghalensis

Striga sp.

Weed Control

Weed control is the process of limiting weed infestation so that the crops could be grown profitably and other activities of man conducted efficiently.

Methods of weed control-

1. Preventive methods
2. Cultural methods
3. Mechanical methods
4. Biological methods
5. Chemical methods

Mechanical methods

"Teen sinchai terah gor, tab dekhen ganne ki por", this old proverb indicates the effect of hoeing on cane yield. Hoeing controls weeds and improves physical condition of soil which facilitates soil aeration and profuse cane root development.

- **manual weeding** is tedious, cumbersome and time consuming and further, scarcity of human labour render operation less effective.
- **Blind hoeing** is helpful in controlling annual / perennial weeds and improving germination of sugarcane crop. Later, two hoeing/ inter- culture may be done when the crop is at knee height.

Earthing up


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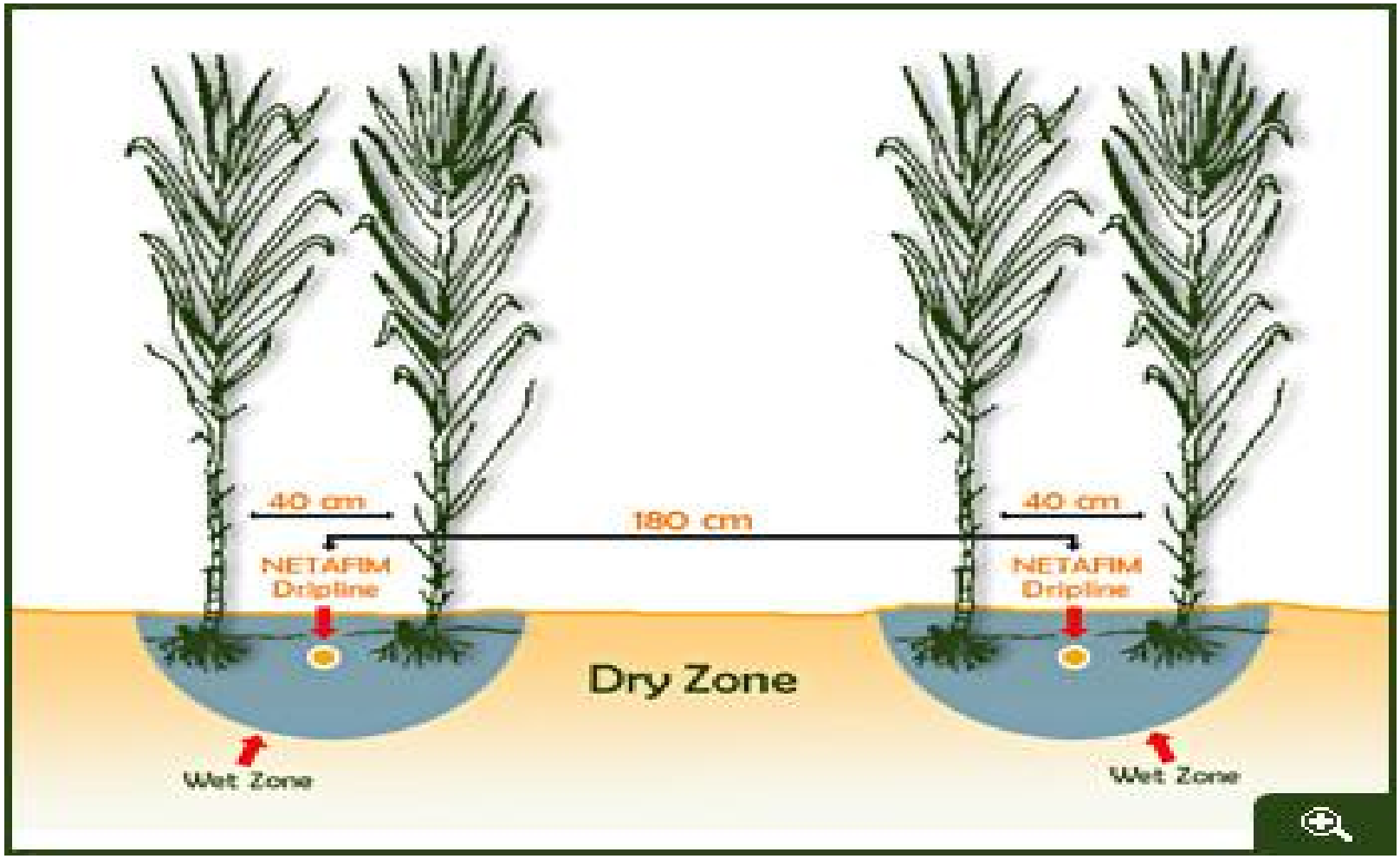
Cultural methods

1. Intercropping

- In widely spaced slow growing sugarcane in the beginning, suitable intercrop not only reduces weed population but also produces additional yield (Singh et al., 1993) and returns.
- Crops like **greengram, blackgram, clusterbean, onion, okra** in autumn planted sugarcane crop are taken up as intercrops.

2.Paired row planting



3. Trash mulching

- **45 DAP** trash mulching at **7.5 t/ha** to an average thickness of **10-12 cm** should be provided in between cane rows.
- Trash cover restricts sunlight and checks weed emergence.
- Besides, suppressing weeds, trash mulching also conserves soil moisture, and provides a potential source of organic matter.

Chemical control

Å Herbicides are being extensively used for weed control in many sugarcane growing countries of the world for the following reasons.

1. Labour is becoming scarce and costly.
2. Conventional methods are inefficient.
3. Initial weed growth cannot be controlled by conventional methods .
4. Timely weeding is becoming difficult by conventional methods and becoming time consuming and costly.

Herbicide recommended a.i.kg/ha	Time of application	Remarks
Atrazine 1.25 kg/ha	PRE-3-4 DAP and at final earthing up	Use higher rate on heavy soils or when sugarcane is planted in July or August
Metribuzine 1.0 kg/ha	PRE 3-4 DAP and at final earthing up	This product is safe to use on all soils and varieties of sugarcane. Use higher rate on heavy soils or when sugarcane is planted in July or August
Diuron 1.0 kg/ha	PRE 3-4 DAP	Use higher rate on heavy soils or when sugarcane is planted in July or August
Pendimethalin 1.0 kg/ha	PRE 3-4 DAP	May be soil applied or incorporated. Use higher rate on heavy soils if surface applied when planting in July or August
Alachlor 1.5 kg/ha	PRE 3-4 DAP	Use higher rate on heavy soils or when sugarcane is planted in July or August

Herbicide recommended a.i.kg/ha	Time of application	Remarks
2,4-D 1.0-2.0 kg/ha	POST 60 DAP	Follow up applications
Paraquat 0.5-1.0 kg/ha	POST and as Follow up application	Use dosage depending on the stage of the weeds. Directed spray on weeds. Can also be used just before emergence of crop, to destroy weeds appearing prior to crop germination.
Glyphosate 1.5 – 2.0 kg/ha	Effective against all weeds except perennial weeds	Directed spray on weeds. Use a hood to target only weeds. There should be target only weeds. There should not be any spray drift to crop.

PRE = Pre emergence POST = Post emergence DAP = Days after planting

Weed management in ratoon crop

The maximum cane yield could be obtained by three hoeing at 30, 60 and 90 days after harvest

OR

Spray of -

1. Atrazine - 2.0 kg/ha as pre-emergence herbicide.
2. 2,4-D - 1.25 kg/ha as post-emergence at 90 days after harvesting.
3. Directed spray of glyphosate 1.0 kg/ha at 150 days after harvesting.

Weed management in Sugarcane intercropping system

- Pre-emergence application of Thiobencarb @ 1.25 kg a.i / ha.

OR

- PPI of fluchloralin or trifluralin and pre-emergence application of alachlor

Integrated Weed Management (IWM)

- The use of all suitable weed control methods in combination, to keep weed populations below the economic injury level is known as IWM.
- Being a long duration and widely spaced crop, there is an ample scope of using cultural/mechanical and chemical methods in combination so as to reduce dependence on either of the methods

IWM - given by IISR, Lucknow

1. Application of atrazine 1.0 kg/ha after 2-3 days of sugarcane planting under moist condition controlled weeds up to 40-45 days.
2. To manage broad leaved weeds, 2,4-D Sodium Salt 1.0 kg/ha was done at 60 days after planting.
3. Finally, one manual hoeing at 90 days after planting was followed.

The technology, controlled all types of weed in sugarcane field.

Integrated weed management technology produced 79 t/ha cane yield with INR 52530/ha net return which were 30 and 48% higher than the farmers' practices, respectively.

IWM – given by TNAU

Critical period of weed control SUGARCANE	4 to 5 months
Cultural method	Remove the weeds along the furrows with hand hoe.
Mechanical method	Work with the junior-hoe along the ridges on 25, 55 and 85 days after planting for removal of weeds and proper stirring
Chemical method	1. Pre-emergence atrazine (2 to 3 kg/ha) Simazine (2 to 3 kg/ha), Alachlor (1.3 to 2.5 kg/ha) etc., will generally last for 8 to 12 weeks 2. To obtain best results sequential application of Pre- and post-emergence herbicides or post emergence herbicides like Glyphosate (0.8 to 1.6 kg/ha) Paraquat (0.4 to 0.8 kg/ha).

Paired row planting + Intercropping + Mulching (intra-row)

IWM For *Striga* control

Å The trials conducted by **UAS, Dharwad** on farmers' fields have revealed that Striga can be effectively controlled by integrated approach.

1. Earthing up at 100 days after planting.
2. Atrazine + 2,4-D or Metribuzin + 2,4-D at 100% or 75% of their recommended doses after earthing up and subsequently 2-3 applications at an interval of 30-40 days.
3. Higher doses of N fertilizers and frequent irrigations are to be applied specially in the *Striga* infested patches.
4. After final herbicide treatment in these patches, mulching is to be done.

CONCLUSION

- Sugarcane being a long duration crop with wider spacing weeds pose a major problem, which can be effectively controlled by combination of various cultural and mechanical methods along with the chemical methods.
- IWM proves to be both economical and effective for weed management in sugarcane crop.

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